European Commission

Science for Environment Policy

Endangered species' response to the dual threat of climate change and invasive species

The joint threat posed by climate change and invasive alien species can have different effects on endangered native species, new research suggests. This European study predicts that the invasive zebra mussel may benefit from climate change, negatively affecting native mussel populations; but both invasive and native crayfish could suffer declines.

Although climate change and invasive species are considered to be the two most important threats to biodiversity, their combined impacts have rarely been assessed, making it difficult to implement effective risk management and conservation measures.

This study evaluates the threat posed by climate change and two of the most harmful and widespread freshwater invasive species in Europe - the zebra mussel and the signal crayfish - on the distribution of two endangered freshwater species: the depressed river mussel and the white-clawed crayfish.

The signal crayfish, originally from North America, competes for habitat and resources with European white-clawed crayfish and carries a fungal disease responsible for drastic reductions of native crayfish populations in Western Europe. Similarly, the zebra mussel, invasive in much of Europe, frequently outcompetes the native depressed river mussel as a result of its faster growth and higher reproductive rates. Both alien species are included in the list of 100 worst invaders in Europe[1], while both of the native species are now on the IUCN Red List of Threatened Species.

In this study, funded by the EU FRESIS[2] project, researchers used regional species distribution models (SDMs) to predict the impact of the expected climate in 2050 on the four species' ranges. Four contrasting future climate scenarios were used to account for the high uncertainty associated with such predictions.

The 2050 scenarios suggested that the invasive zebra mussel could strongly benefit from climate change's effects, with an increase of 15-20% in their range size, invading new areas in northeast Europe. In contrast, the native depressed river mussel was predicted to experience considerable loss of 14-36%. Furthermore, populations could decline even further as a result of a predicted increase in range overlap (up to 24%) with the faster growing zebra mussel population.

Conversely, negative effects of climatic changes for both species of crayfish were predicted, especially the invasive signal crayfish, which could suffer up to 32% decrease in range size. The overlap between the ranges of the two crayfishes was also expected to decrease by 13-16%.

Forecasting how both invasive and native species will respond to climate change is of vital importance to conservation management strategies. SDMs can assist in the management of endangered species over large spatial scales and long time periods by anticipating future changes in distribution and identifying potential refuge areas. However, the researchers note that changing climatic conditions create uncertainties in SDM predictions relating to species adaptation to future environments.

September 2013 Thematic Issue 41: Invasive Alien Species

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Source: Gallardo, B. & Aldridge, D. C. (2013). Evaluating the combined threat of climate change and biological invasions on endangered species. *Biological Conservation.* 160: 225-233. DOI:10.1016.j.biocon.2013.02.001.

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To cite this article/service: "Science for Environment Policy": European Commission DG Environment News Alert Service, edited by SCU, The University of the West of England, Bristol.

1.See: DAISIE European Alien Invasive Species Gateway, http://www.europe-aliens.org/

2.FRESIS (Freshwater invasive species in Europe: control, prevention and eradication) was supported by the European Commission under the Seventh Framework Programme. See: http://cordis.europa.eu/projects/rcn/94723_en.html